

September 17, 2028:

I suppose I should explain what this is, given that I've never done this before. After 4 years of conducting research on the *H. ocellatum* population in the Capricorn-Bunker Group, I've decided to keep a weekly journal from this year going forward. To be honest, it's mostly for my sanity; living on a tiny island can make you go a bit stir-crazy, especially when most of your companions are sharks. It was actually Jess' idea; she actually started listing ways it could benefit the research until I agreed. I still doubt that my "improved emotional regulation" will help me "commune with the sea puppies", but I suppose I should trust her on this one. I'm just glad she's as supportive of my research as I am invested in it, really.

I still find it strange how, year after year, I forget just how much I love conducting this research. I'm sure it doesn't hurt that Heron Island has a dedicated resort, regardless of my distaste for the commercialisation of the delicate ecosystem. I honestly don't understand where they expected us to stay though; they know the island only has one place to stay, but apparently covering the cost of the resort would be an ethics violation? Bureaucracy will forever be a mystery I suppose. But either way, I spend most of my time observing sharks at the Great Barrier Reef, so any complaints I have are limited to nitpicks.

Speaking (writing?) of the sharks, I've noticed some interesting trends in the coloration of *H. ocellatum* in the area: many of them are noticeably lighter, less saturated than their species tends to be. I suppose it should be expected, coral bleaching is only becoming more widespread as the years go on, so a lighter coloration would be better for blending in. We've previously documented a fairly wide range of coloration in previous years, so it's not unlikely for environmental changes to affect the population so quickly. Still, I want to go over the records from recent years; directional selection should occur fairly slowly in *H. ocellatum*, given that they reach sexual maturity around 7 years of age.

More anecdotally, it seems like individuals spend less time in isolated tidal pools before relocating; in past years, individuals would often stay in the same pool until the next high tide, sometimes relocating after 5-8 hours in a smaller pool, but I'm noticing relocation more frequently than I remember, sometimes taking as little as 3 hours before relocating. Maybe I should check this year's acidity and oxygen saturation measurements, as depressing as that will likely be. If there is significantly less oxygen available, or if a high acidity is impeding respiration, this could simply be a change in the environment rather than in behavior.

To be transparent, I'm slightly conflicted on this change in behavior: on the one hand, it's a fantastic opportunity to observe the terrestrial ambulatory behavior of the sharks in the wild, but on the other, it's likely that the actual cause of the change is further damage to the reef itself. And while epaulette sharks can manage a decreased oxygen saturation and increased acidity uniquely well, other species aren't so well suited for such a change; there's a reason the recent algae blooms are so harmful.

September 24, 2028:

Well. I knew I probably wouldn't have the time to review the literature, but I thought it would just be due to the usual observations. Boy did that change. So, earlier in the week, we were able to take some measurements on a decent number of *H. ocellatum* individuals, including some with the lighter coloration I noted last week. We got the usual measurements for *Hemiscyllium* sharks: length, weight, barbel size, fin measurements, tooth mobility, and intraocular pressure. Turns out, color wasn't the only difference.

Ok, so, in terms of length, weight, barbel size, and fin measurements, all of the individuals were well within the expected deviation. Tooth mobility and intraocular pressure though? They were significantly different. All the sharks with the darker coloration that is the norm for their species had measurements consistent with previous years, if slightly increased tooth mobility. However, those with the lighter coloration had both decreased tooth mobility and decreased intraocular pressure. I'm honestly unsure why these traits would be selected for, especially when there seems to be disruptive selection occurring with tooth mobility. It almost seems like the differentiation of a sub-species, but that's almost certainly me jumping the gun.

I've been trying to come up with any connection between these two traits, but the only commonality I can think of is that they're fairly special to *Hemiscyllium* sharks: they tend to have lower intraocular pressure than other shallow water fish due to their tendency to leave the water in search of new tidal pools, and their teeth are able to rotate when pressure is applied to allow for crushing of hard shells, which I think is just incredible. It seems counter-intuitive that these traits would be selected in different directions then; one further from typical sharks and the other closer to the norm. Maybe I'm just biased in considering the traits as a pair? I do focus my research on these sharks in particular after all, maybe I need to take a step back. Y'know, see the forest instead of the trees, at least from a logical standpoint. Either way, I'm not about to stop researching epaulettes just because I'm a little biased sometimes. Bias is unavoidable; better to be aware of it and work with it than try to escape it and fall victim to more, unknown biases.

October 1, 2028:

Remember how I said that the idea of these sharks being a subspecies was jumping the gun? I take it all back, at least with the new information we have now. This week, we were lucky enough, at least from a research standpoint, to find a number of recently deceased individuals which displayed the lighter coloration, decreased intraocular pressure, and decreased tooth mobility we observed previously in a number of individuals. As sad as I may find it, it was an incredible asset to our research.

Upon dissection of the deceased individuals, which appeared to have died of starvation, we noted numerous adaptations that I will split into two categories: ocular adaptations and respiratory adaptations. The ocular adaptations are, in my opinion, the less interesting of the two categories. While this is not comprehensive of the full findings, we observed multiple changes to the structure of the eyes, including the structures responsible for dilation of the pupils and the shape of the lens, which would move the focal point of the eye away from the retina. Personally, I think it's possible that such adaptations would be better suited for improved vision outside of the water, which, due to the already poor eyesight of *H. ocellatum*, would not significantly impair their fitness in the water.

Now, what I find most interesting are the respiratory adaptations we found. As a quick and loose summary of the observations, we found a much wider distribution of dense capillary networks in the epithelial tissue of the buccal-opercular chamber along with a thicker tissue layer of the secondary lamellar vasculature. Both of these adaptations should be selected against, with the latter being detrimental to normal respiratory function. Instead of this, we see an increasing prevalence of these traits, strongly correlated with other, more easily observed differences. This would suggest, at the very least, the formation of a distinct subspecies of *H. ocellatum* which is strangely less fit in the species' typical environment.

Now that I've written down the new findings, I feel like I should explain my own hypotheses concerning them. This is my personal journal after all. From what I recall of my previous research on mudskippers, though it has been a decade at least, these respiratory traits we observed in the abnormal individuals bear a striking similarity to the unique respiratory traits of mudskippers, which are notable for their ability to breathe terrestrially. This, along with the ocular changes potentially being better suited for vision outside of water, leads me to hypothesize that this population is evolving towards a more amphibious lifestyle, possibly in response to the worsening environment of the Great Barrier Reef and the oceans in general. Just imagine that; life once again

going from the water to the land, spurred on by our own hubris. I don't know whether I find it depressing or uplifting, to be honest.

In any case, and this is almost certainly me getting ahead of myself, if the observed differences in the respiratory system are in fact conducive to terrestrial breathing to some extent, I would propose that this population be recognised as a new species. At the risk of being too optimistic or spurious, I would think that *spiraductum* is a fitting name, from the latin *spira-*, meaning “breathing”, and *duco*, meaning “to lead”. Plus, *Hemiscyllium spiraductum* just has a certain ring to it.